from those edges towards the centre of the planes, such as is exhibited in crystals of alum partially dissolved by elevation of the temperature of the mother solution in which the crystals were originally formed.

He stated that he had examined and assayed some remarkable specimens of native gold from California, one single mass examined by him weighing 265 ounces, and containing 235 ounces of California gold, or 200 ounces of fine gold, and 35 ounces of silver. This single specimen is worth $3,885, and is the largest that has been brought from California to this city.

Dr. J. C. Warren exhibited to the Academy some large and valuable casts of fossils from the Sivâlik Hills, situated in the northern part of Hindostan, which he described and remarked upon at considerable length.

Mr. J. D. Whitney gave an account of the progress of the geological survey of the United States mineral lands in Michigan, and of its results; and exhibited several geological maps of that region executed for the United States.

Three hundred and forty-first meeting.

January 7, 1851. — MONTHLY MEETING.

The PRESIDENT in the chair.

Professor Peirce made some remarks respecting the uncertainty existing in regard to the masses of the planets. They vary when determined by different satellites, and should be taken as determined by actions upon planets, rather than upon satellites. The observations of Mr. Bond upon the satellite of Neptune give a less mass to that planet than those of the Pulkova Observatory, or those of Mr. Lassell; but the accuracy of Mr. Bond's observations is confirmed by the perturbations of Uranus. Professor Peirce stated the amount of discrepancy, as to the masses of several of the planets, between observation and theory. He said that theoretical errors could sometimes

be detected by empirical means, and gave an empirical correction of the theory of Saturn. He further stated, that there are some indications of the secular action of a planet within the orbit of Mercury.

Professor Lovering described an experiment in electricity, and continued : —

"It is hardly necessary to remind the Academy of the two theories devised more than a century since to explain the phenomena of electrostatics. One of these theories, known as the theory of Dufay, attributes the two electrical states of a body to an excess of one or the other of two distinct electrical fluids. The other theory, known as the theory of Franklin, admits the existence of only a single electrical fluid, and refers the two electrical states of a body to an excess or a deficiency of this fluid.

" The imponderability of the electrical fluid, the transcendent velocity with which it moves, the facility with which it changes the direction of its motion when in full speed, and the absence of all visible signs of inertia in its swift flight, are not easily to be reconciled with the hypothesis of its materiality. To assert that electricity is matter, and in the same breath to deny to it all the universal properties of matter, is a plain confession of our ignorance.

" Nevertheless, these theories are convenient artifices for symbolizing the phenomena of electrical activity, and furnishing simple expressions for laws which otherwise could be described only by intricate algebraical formulæ. That protracted struggle between the two theories, the issue of which is still so uncertain, has no longer reference to the question which of these theories expresses a physical reality ; but to this other question, which of these theories may be considered as the best artifice for grouping together phenomena, the dynamical relations of which are not yet distinctly understood.

" The exclusive advocates of one or the other theory, not being able to find an *experimentum crucis* among the statical facts of electricity, have made their strong appeal to certain appearances observed in current electricity. These are all of the same general character, but I desire at this time to call attention to only a single one, namely, the direction in which the little wheel, with pasteboard vanes, moves when exposed to the electricity which circulates from arm to arm of the universal discharger. Those who have opposed the conclusion in favor

of Franklin's theory drawn from this experiment, have been contented with showing that the direction of motion is not always in correspondence with a current passing from the positive to the negative arm, and that trifling modifications in the experiment are sufficient to change the direction of the motion. I have been able to satisfy myself that the motion is not produced either by the electrical current (a supposition which probably few would adopt), or by the current of air which accompanies the passage of the electricity; and that, therefore, the direction of the motion, even if it were always the same, would justify no inference in regard to the direction of the electrical current. This motion is another instance of that numerous class which depends on alternate attractions and repulsions. This we can show by the following experiments: — 1. By substituting a ball for the pointed extremity of the discharging-wire, the motion continues and its velocity is increased. 2. If the wheel is insulated, no motion can be produced either with a pointed or blunt discharging-rod.

"Where the wheel is exposed between the arms of the universal discharger to a similar action on both sides, the direction of the motion will be determined by the relative tension of the two arms, and this relative tension will depend on the shape and mass of the metal connected with the prime conductor, as compared with the shape and mass of the metal connected with the rubber. Ordinarily, the negative mass is small, imperfectly insulated, and not communicating freely with the inside of the rubber, where the electricity is generated. These remarks apply with equal force to all those test experiments analogous to the one I have particularly discussed."

Mr. J. H. Abbot communicated some additional electrical facts, among which he described the effects produced by lightning upon a savin or red-cedar tree, the *Juniperus Virginiana* of botanists, in the eastern part of Beverly, in the summer of the year 1845. The course of the lightning could be traced by displaced stones, and several discontinuous furrows radiating from the trunk of the tree, one of which extended to the distance of two or three rods, while the tree itself was uninjured. These effects Mr. Abbot contrasted with the effects produced by lightning, during the same summer, upon a large chestnut-tree, in the northern part of Mason, New Hampshire, a large part of which was shivered into fragments, and

scattered over an area more than a dozen rods in diameter. The great difference in the effects produced by lightning in these two instances Mr. Abbot attributed to a remarkable conducting power possessed by the red-cedar, and perhaps by other evergreens.

Mr. Bouvé remarked that those present were probably aware that a substance has been at times taken from the iron furnaces of England and Scotland, appearing in minute cubic crystals, having the color and more than the lustre of metallic copper, and which mineralogists had hitherto considered the pure metal titanium.

"Having in my possession the finest specimen perhaps ever obtained, which I received from one of the furnaces of Scotland, I would, in exhibiting it, call the attention of those interested to the remarkable fact lately made known by Wohler, that, instead of this substance being pure titanium, as has been believed, it is in fact a nitruret and cyanuret of titanium.

"Considering the nature of nitrogen, that it is one of the most evanescent of known elements, it is certainly a matter that may well surprise chemists, that it should be found a constituent part of a body formed under circumstances of such intense heat as exists in a blast furnace.

"The specimen just presented exhibits crystals of great beauty, having the color of copper and a brilliant lustre. Some of them are nearly one eighth of an inch in size."

Professor Horsford referred to a compound of nitrogen and boron, as nearly allied to the crystals exhibited by Mr. Bouvé. He announced the discovery of iodine in the ammoniacal liquor of gas-works, by Mr. Storer of the Lawrence Scientific School; and also the discovery of manganese in urine and in the tea-plant.

Mr. James Hall gave some account of his investigations, during the past summer, on Drummond's Island, and the north shore of Lake Huron and Lake Michigan, in connection with the geological survey under the direction of Messrs. Foster and Whitney.

" These investigations show that the strata recognized in the State of New York can be traced over this entire extent, and everywhere recognized by their lithological and fossil characters. On St. Joseph's Island, in the St. Mary's River, I have recognized the Chazy and Birdseye limestones; the Black River limestone, by its fossils, in a thin band above the Birdseye; and the Trenton limestone, preserving, to a great extent, the same lithological characters, and containing the same fossils, as in New York. I have traced the same strata, particularly the Birdseye and Trenton limestones, across to the Mississippi River, everywhere characterized by the same fossils.

" The ' blue limestone ' of Cincinnati and other Western localities, I have already proved to be a continuation of the Hudson River Group of New York, and to be always above the Trenton limestone when occurring at all. The Niagara limestone can be traced along the entire distance, and across to the Mississippi River. At Milwaukie and other places, it is characterized by numerous fossils identical with those found in the same rock in New York.

" After a more critical examination, I have satisfied myself that the lead-bearing rock of Wisconsin and Iowa is not a part of the Niagara limestone, as I had supposed, but a member of the Lower Silurian series, which, in the absence of the shales of the Hudson River Group, succeeds the Trenton limestone proper, — as that rock is known in New York and elsewhere, — and is a member of the series which I had failed to recognize east of the Escanaba River. The fossils this rock contains are of Lower Silurian types. The name Galena limestone has been adopted for this rock.

" I have also satisfied myself that the sandstones of the Upper Mississippi are of the same age as the Potsdam sandstones, and that the lower magnesian limestone of the Western geologists is identical with the calciferous sandstone of New York, the next member of the series above the Potsdam sandstone. The thin bed of sandstone succeeding this rock cannot be identified as the Potsdam sandstone by itself, but must be regarded as a repetition of the arenaceous deposits below, which likewise alternate with the calciferous sandstone near its base.

" All these investigations have proved the continuity and identity of many of the most important formations, while others are wanting, and thus allow two widely separated formations of the East to come in contact, and apparently form one rock, at the West."